NAVAL AVIATION VISION
2020

Sea Shield Aircraft Roadmap

Broad Area Maritime Surveillance Unmanned Aerial Vehicle (BAMS UAV)

The BAMS UAV fulfills multiple roles in support of Sea Power 21. Its capabilities include long dwell time on station, persistent ISR with worldwide access, and continuous open ocean and littoral maritime surveillance as far as 3,000 miles from the launch point. The BAMS UAV will operate above 40,000 feet and significantly enhance maritime connectivity, command and control, communications, and intelligence. It will complement platforms such as the P-8A Multi-Mission Aircraft (MMA) and Vertical Takeoff and Landing Tactical UAVs (VTUAVs). IOC for BAMS UAV is FY 2013.

*Artist's conception

TODAY

P-3C

2020

BAMS*

MMA

P-8A Multi-Mission Maritime Aircraft (MMA)

The P-8A MMA will replace the P-3C *Orion*, which is approaching the end of its service life. The MMA's transformational, bottom-up design will integrate the aircraft's onboard mission suite with UAV-based and satellite-based systems and sensors. The P-8A will transform ASW and ISR warfighting by incorporating technological advances in networks, sensors, and communications. It will assure battle force access across the broad littoral, contributing to the Navy's ability to project power ashore. IOC for the P-8A MMA is FY 2013.

RQ-8B *Fire Scout* Vertical Takeoff and Landing Tactical UAV

The RQ-8B *Fire Scout* Vertical Takeoff and Landing Tactical Unmanned Aerial Vehicle (VTUAV) together with the MH-60R or MH-60S will provide organic Mine Interdiction Warfare (MIW), Surface Warfare (SUW), and ASW support to Littoral Combat Ships (LCS). *Fire Scout's* advanced sensors and systems will provide LCS with vital ISR, communications, and data link connectivity. IOC for the RQ-8B is FY 2008.

UAV Tactical Control System

Command and control of UAVs is accomplished through the Tactical Control System (TCS). TCS software will comply with the Defense Information Infrastructure/Common Operating Environment (DII-COE) and NATO standards for interoperability, so that data can be disseminated to Joint and service-specific C^4I systems. The interoperability and commonality of TCS will make future UAVs fully compatible with fielded combat systems, enabling connectivity with aircraft carriers, large-deck amphibious ships, command ships, and ground force commands.

MH-60R/S *Seahawk* Multi-Mission Combat Helicopter

The MH-60R and MH-60S multi-mission combat helicopters are the pillars of the Chief of Naval Operations' (CNO) Naval Helicopter Concept of Operations (CONOPS) for the 21st century. Under the "Helo CONOPS," the two *Seahawk* variants will deploy as companion squadrons embarked on aircraft carriers, surface ships, and logistics vessels under the leadership of the Carrier Air Wing Commander. The 85 percent commonality between the "R" and "S" variants will ease maintenance and logistics support.

MH-60R

The MH-60R will perform the Sea Shield mission, providing surface and subsurface warfare support with its Airborne Low Frequency Sonar (ALFS), Electronic Support Measures (ESM), Advanced Forward-Looking InfraRed (FLIR), precision air-to-ground missiles, machine guns, and lightweight torpedoes. IOC for the MH-60R is FY 2006.

TODAY

2020

RQ-8B

SH-60B

MH-60R

SH-60F

MH-60S

The MH-60S will partner with the MH-60R for surface warfare missions, carrying the same FLIR and air-to-ground weaponry and machine guns. Additionally, it will have the capability to support Combat Search And Rescue (CSAR) and Naval Special Warfare (NSW) Joint Theater operations. The platform will perform the Organic Airborne Mine CounterMeasures (OAMCM) mission using any one of five advanced sensor/weapons packages to provide detection, localization, and neutralization of anti-access threats. The MH-60S will also anchor the Fleet logistics role in CSG and ESG operations.

Whether or not the MH-53E will conduct dedicated Airborne Mine CounterMeasures (AMCM) depends on the performance of new generation AMCM systems being employed now by the MH-60S. The CVN Vertical Onboard Delivery (VOD) requirement is presently being evaluated. If substantiated, the MH-53E will retain the VOD role and eventually transition to another aircraft, possibly the HLR.

TODAY

2020

HH-1N

HH-60H

MH-60S

MH-60S

UH-3H

MH-53E

VOD MISSION
REPLACEMENT
AIRCRAFT

C-9B / DC-9

C-40A

2020

C-40A

UNITED STATES NAVY

Navy Unique Fleet Essential Airlift (NUFEA)

NUFEA aircraft provide Combatant Commanders with short-notice, fast-response, global logistics support. Currently comprised of several aircraft platforms, NUFEA assets deliver medium- and heavy-lift capability across short, medium, and long ranges. They are designed primarily to provide wartime movement of personnel and materiel and are force enablers integral to Sea Basing, because they support transitory beachheads by bringing personnel and equipment down the "last mile" of the logistics trail.

C-40A *Clipper*

The C-40A *Clipper*, a Boeing 737 derivative with multi-passenger/cargo configuration combinations, will replace the aging C-9 *Skytrain* fleet. The venerable C-9 has served the Fleet exceptionally well for the past 30 years, but with an average aircraft age of 29 years, maintenance costs are steadily rising. The Navy will introduce the C-40A to lead the NUFEA contingent into the 21st century, with increased range, capacity, and fuel efficiencies to support sea-based logistics.

UC-35 Cessna *Citation*

The Marine Corps' UC-35 Cessna *Citation* is a derivative of the Model 560 *Citation V*, and is a medium-range support aircraft able to use short runways to move passengers or cargo with mission-sensitive requirements.

C-37 *Gulfstream*

The C-37 *Gulfstream* executive-transport aircraft replaces the aging VP-3A and C-20A to provide state-of-the-art, high-speed, long-range transportation for senior Navy Department personnel.
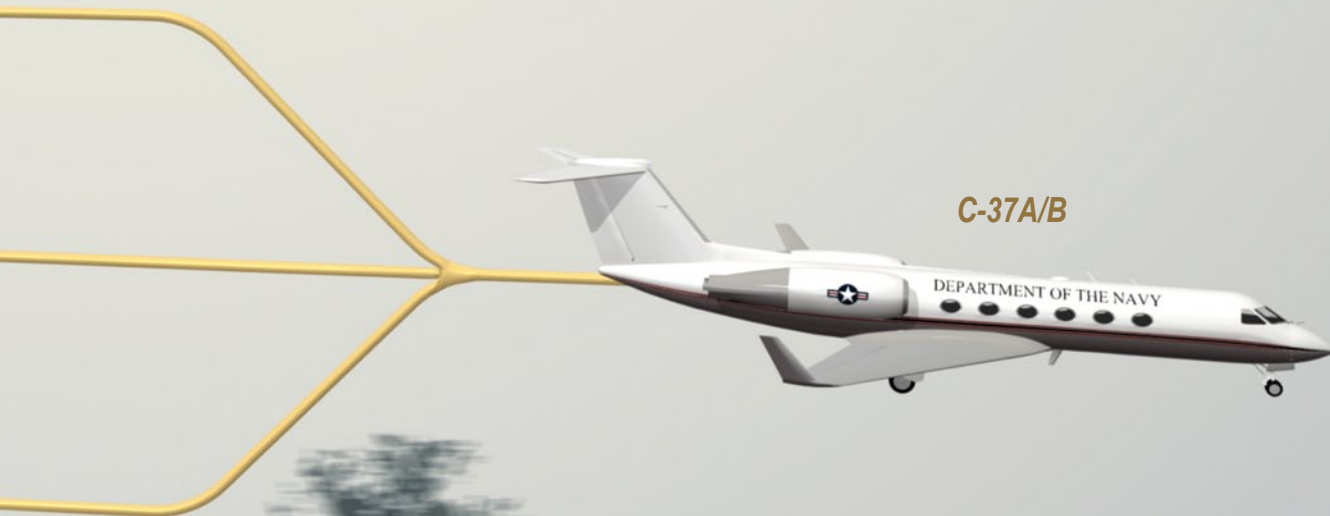
TODAY

UC-35C/D

C-20A

C-37A/B

VP-3A

163692

2020

C-37A/B

DEPARTMENT OF THE NAVY

Other Transport Aircraft

The remaining transport aircraft, led by the venerable C-130T *Hercules*, and joined by the C-2, C-26, C-20D/G, and C-12, are stalwart performers and will continue to provide heavy, outsize and long-range lift capability well into the 21st century. Projected to receive the Avionics Modernization Program (AMP), the C-130 stands poised to enter the 21st century fully compliant with international standards and ready to meet the requirements of Combatant Commanders. A COD mission replacement aircraft, with an IOC of 2017, will replace the C-2A.

KC-130J *Super Hercules*

The KC-130J *Super Hercules* is a multi-role, multi-mission tactical tanker and assault support transport aircraft, well suited to the mission needs of the forward-deployed Marine Air-Ground Task Force. As the replacement for the aging KC-130F/R, the "J" model provides increased speed and range, an improved refueling system, a digital cockpit, night-vision systems capabilities, and increased survivability.

C-26D

UC-12B/F

C-2A

*COD MISSION
REPLACEMENT
AIRCRAFT*

C-20D/G

C-130T

KC-130T/J

KC-130F/R/T/J

UNITED STATES NAVY

993

E-2C *Hawkeye*/E-2D *Advanced Hawkeye*

Providing Airborne Early Warning (AEW), Battle Management, and Command and Control (C²) for the CSG and Joint Commanders, the E-2C/D will remain a primary enabler of decisive power projection at sea and over land in the Joint operational environment. The latest variant of the E-2C, known as *Hawkeye 2000*, and the E-2D *Advanced Hawkeye*, a two-generation leap in systems capability, make the *Hawkeye* a critical node in network-centric air operations supporting Sea Shield and Sea Strike. *Hawkeye* system capabilities are fully interoperable with the E-3 *Sentry's* Airborne Warning And Control System (AWACS) and accompanying ground-based C² systems. Radar improvements coupled with Cooperative Engagement Capability (CEC) will make the E-2D an important participant in Theater Ballistic Missile and Cruise Missile Defense (TBMD/CMD) helping the CSG provide homeland/allied nation security and U.S./coalition force protection. IOC for the E-2D *Advanced Hawkeye* is FY 2011.

Aerial Common Sensor (ACS)

ACS is a cooperative development program with the Army and is designated to replace the EP-3E *Aries* aircraft. ACS mission systems will form a robust ISR capability using a combination of Signals Intelligence (SIGINT), Imagery Intelligence (IMINT), and Measurements and Signatures Intelligence (MASINT) in support of maritime, Joint, and national tactical and strategic objectives.

With its network-centric open architecture, ACS will function as a node of the Distributed Common Ground System-Navy (DCGS-N). Additionally, ACS will be enabled by a robust reach-back capability, increasing combat effectiveness through the use of off-board resources located ashore and afloat. ACS will ensure information dominance well into the 21st century in support of maritime and Joint forces. IOC for ACS is FY 2012.

TODAY
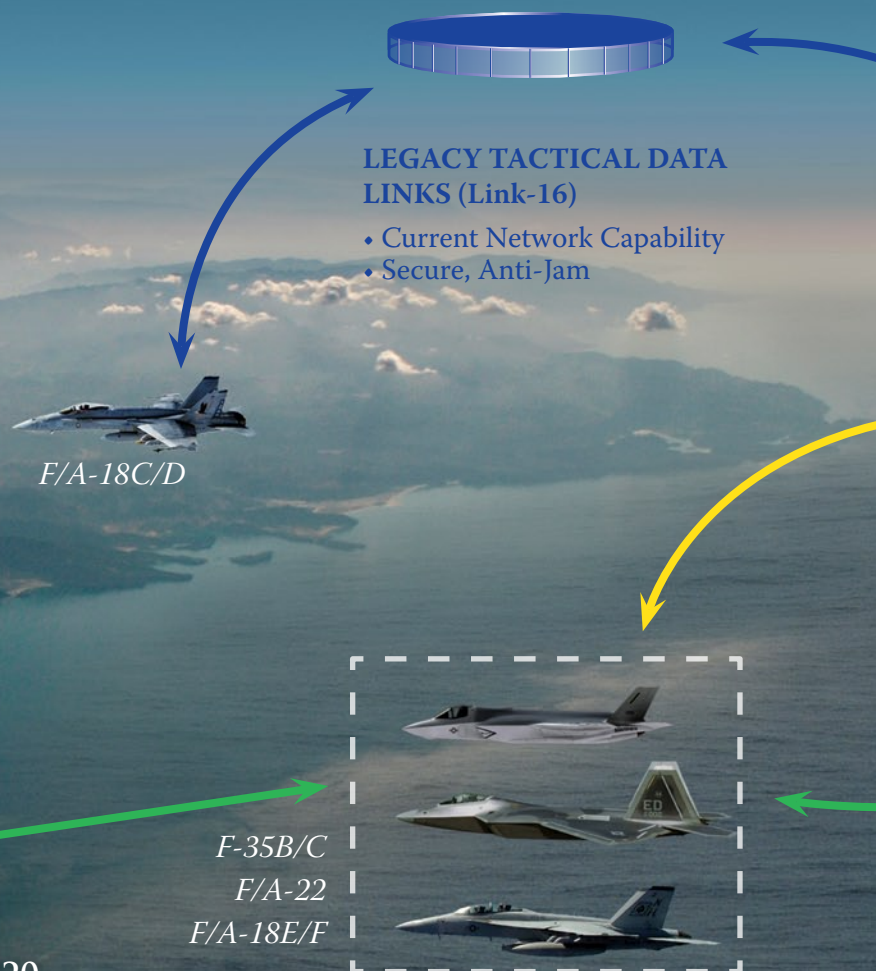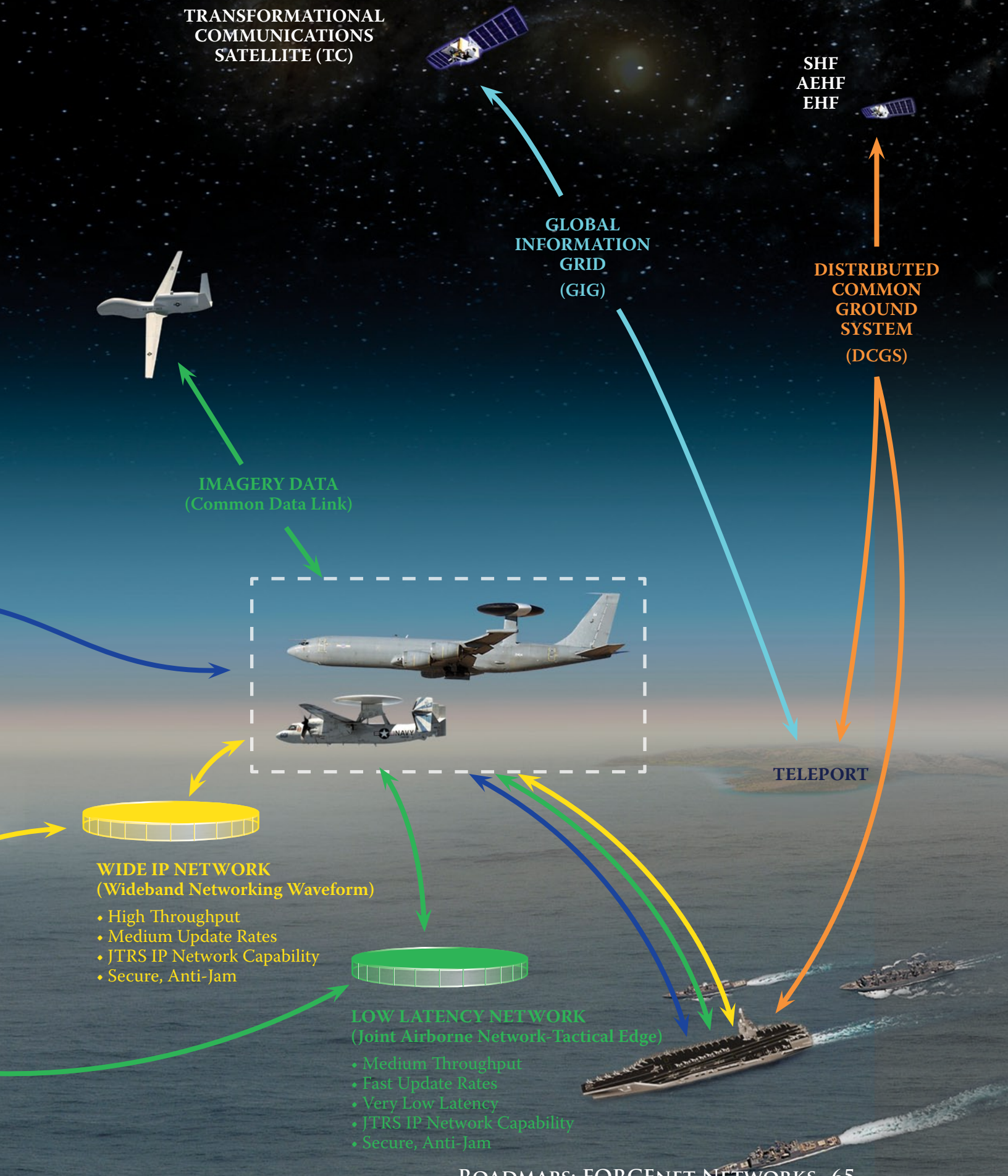
E2-C

EP-3E

2020

E-2D

ACS

FORCEnet Networks

Networks that are interoperable with Joint forces will be fundamental to battlespace dominance, and FORCEnet will provide the architectural framework for that Joint interoperability. Naval Aviation and surface platforms will exchange images, signals, and data much the same way we do with the commercial Internet, speeding the flow of information to shorten the kill chain.

The Naval Information Grid, comprised of voice, video, data network, and information systems, will provide connectivity between surface, subsurface, and air warfare domains including access to Joint Services and the GIG. The Joint Airborne Network-Tactical Edge (JAN-TE) will provide airborne platforms with fast network entry and low latency communications to support high-speed, tactical aircraft and networked weapons.

A key program designed to enhance communications is the Joint Tactical Radio System (JTRS). JTRS is a DoD initiative that fulfills Joint Service communication requirements for Internet Protocol (IP)-based, software-programmable radio technology with a single (clustered) acquisition effort. JTRS will provide seamless, real-time interoperable voice, data, and video communications between Joint U.S. Warfighters, coalition forces, and allies.

LEGACY TACTICAL DATA LINKS (Link-16)

• Current Network Capability
• Secure, Anti-Jam

F/A-18C/D

F-35B/C
F/A-22
F/A-18E/F

TRANSFORMATIONAL
COMMUNICATIONS
SATELLITE (TC)

SHF
AEHF
EHF

GLOBAL
INFORMATION
GRID
(GIG)

DISTRIBUTED
COMMON
GROUND
SYSTEM
(DCGS)

IMAGERY DATA
(Common Data Link)

TELEPORT

WIDE IP NETWORK
(Wideband Networking Waveform)

• High Throughput
• Medium Update Rates
• JTRS IP Network Capability
• Secure, Anti-Jam

LOW LATENCY NETWORK
(Joint Airborne Network-Tactical Edge)

• Medium Throughput
• Fast Update Rates
• Very Low Latency
• JTRS IP Network Capability
• Secure, Anti-Jam

Persistent ISR

Naval Aviation will deny sanctuary to potential adversaries by providing the Joint Force Commander with extensive ISR through a combination of manned and unmanned aircraft positioned throughout the tactical battlespace. These platforms will employ sophisticated sensors that provide information on enemy activity to the Joint Force Commander, so that strikes can be planned and launched.

To achieve this, however, we must upgrade legacy networks and systems while developing and acquiring powerful new ones. Entirely new sensor systems are in development that will provide our ships, aircraft, and ground forces with the critical situational awareness they require. These efforts will provide a marked improvement in the sensor-to-shooter decision process fundamental to Sea Strike.

Distributed Common Ground System-Navy (DCGS-N)

DCGS-N merges ISRT (Intelligence, Surveillance, Reconnaissance, and Targeting), mission planning, and situational awareness. The core capability of DCGS-N is derived from the convergence of the Joint Fires Network (JFN) and the Joint Sensor Image Processing System-Navy (JSIPS-N). These two ISR systems interface with sensors and weapons systems to receive, display, correlate, fuse, and maintain geolocation track information on all forces on land, at sea, and in the air. Additionally, DCGS-N will be designed to accept ISR inputs from various Joint assets for intelligence, mission planning, and fire control/combat systems, providing a unique Time Critical Targeting (TCT)/Time Sensitive Strike (TSS) capability to units afloat and the Joint Forces Maritime Component Commander.

Common Data Link-Navy (CDL-N)

The Common Data Link-Navy (CDL-N) will be installed on aircraft carriers, amphibious warships, and amphibious command ships. The surface-mounted terminal receives signal and imagery intelligence data from remote sensors, and transmits link and sensor control data to airborne ISR platforms. The CDL-N system also links airborne ISR sensors and the shipboard processors of the DCGS-N and the Battle Group Passive Horizon Extension System (BGPHES)-Surface Terminal.

ATDLS Link-11/16

Link-16 is the primary Joint Tactical Data Link for the Department of Defense, and Link-11 is the common tactical data link for all U.S. Navy and allied ships not equipped with Link-16. In the interest of Joint interoperability, the Navy is installing Link-16 on most of its link-capable platforms. The Advanced Tactical Data Link System (ATDLS) program delivers Link-16 hardware to the Fleet and funds improvements.

Aircraft transmit and receive Link-16 information via the Multi-functional Information Distribution System-Low Volume Terminal (MIDS-LVT). The form-fit replacement for MIDS-LVT is MIDS-JTRS, which will be equipped with additional channel capability to host Link-16 and other JTRS waveforms. MIDS-JTRS will also support the eventual migration to IP-based networking.

Joint Mission Planning System (JMPS)

JMPS will replace the Tactical Automated Mission Planning System (TAMPS) and the Navy-Portable Flight Planning Software (N-PFPS). It integrates improved ISR with mission planning, significantly reducing the time required to execute tactical missions. JMPS and follow-on integrations offer important new features that extend the Navy's ability to plan and execute TACAIR operations.

Cooperative Engagement Capability (CEC)

The Navy's CEC system has significantly improved the CSG's air defense against the most sophisticated aerial threats. This system integrates the sensor data of each cooperating ship and aircraft into a single composite track picture—one with real-time, fire-control quality. CEC distributes sensor data on airborne threats to every ship in a strike group, extending the range at which hostile missiles and aircraft can be engaged to well beyond the radar horizon. When used in conjunction with the FORCEnet architecture, CEC will improve targeting against enemy air and land threats, as well as time-critical targets.

FORCEnet Sensors

Powerful, sophisticated, and linked sensors aboard highly survivable Naval platforms will provide the tactical knowledge necessary to accomplish Sea Strike and Sea Shield. Our Sea Warriors will operate these sensors in all dimensions of the battlespace, collecting and processing the data needed to formulate a complete tactical picture. Sensor data from disparate sources will enhance the ability to identify friendly and hostile targets in all environments, and information fusion will facilitate the intelligent management of Naval Aviation's vast sensor grid.

In the Radio Frequency (RF) spectrum, Navy and Marine Corps operators will enjoy a renaissance of radar system upgrades in nearly every mission area. Multi-function radars will transform into multi-function RF systems, capable of conducting radar search, electronic warning, communications, and electronic attack.

Multi-spectral and hyper-spectral systems technology will continue to mature, capitalizing on the entire Electro-Optical (EO) spectrum. Different spectrum wavelengths give Hyper-Spectral Imaging a greater degree of fidelity, making it ideal for locating camouflaged targets and providing a more complete picture of the battlespace. Active and modulated laser systems will enable improved pointing and the ability to process backscatter in obscured environments. Like the new RF systems, EO/InfraRed (IR) sensors will become multi-functional, performing navigation, threat warning, and targeting.

At the low end of the electromagnetic spectrum, magnetic anomaly detection sensors will leverage digital technology to double detection range and reduce false alarms. Future sensors leveraging laser technology will be 30 times more sensitive than existing sensors, enhancing detection and localization of underwater targets.

The future of ASW lies in distributed off-board sensing. Air-launched acoustic sensors will evolve from short-life tactical sonobuoys, to powerful, multifunction, long-life nodes of undersea sensor grids that can be delivered by manned aircraft or UAVs. Contact information will be passed directly to the GIG, creating a comprehensive undersea battlespace picture. Improved acoustic environmental sensing, modeling, and prediction capabilities will enable tailored sensor deployment to exploit the varying conditions of littoral waters.

Current, active, multistatic tactical sensing will improve with the Advanced Extended Echo Ranging (AEER) system. AEER incorporates a coherent active source along with sophisticated signal processing algorithms to reduce false alarms in shallow water environments, enhancing detection of slow and bottomed targets. This coherent source technology will also provide increased localization and attack capability in littoral regions.

The Compact Deployable Multistatic Receiver (CDMR) program will transform the AN/SSQ-101 Air Deployable Active Receiver (ADAR) sonobuoy into a multi-day, semi-autonomous active/passive receiver capable of Over-The-Horizon (OTH) communication and control. The companion Compact Deployable Multistatic Source (CDMS) program will produce a highly capable, air deployable, multi-day, coherent active source that also can be remotely commanded. With semi-autonomous operation and OTH connectivity, CDMR and CDMS will eliminate the need for continuous MPA presence to monitor and control sensor fields during multi-day surveillance operations.

Key Transformational Sensor Systems For Naval Aviation

ATFLIR is an infrared autonomous precision-targeting system that is being introduced into fleet F/A-18C *Hornets* and F/A-18E/F *Super Hornets*. It acquires, recognizes, and tracks air and surface targets with Global Positioning System (GPS)-level accuracy. ATFLIR replaces several older systems with a single pod that provides superior target recognition, image magnification, and standoff range.

The F/A-18E/F's AESA program increases air-to-air performance and provides important electronic warfare functionality. Phase I enhances air-to-air performance in hostile electronic countermeasures environments and in air-to-ground targeting. Phase II improves the targeting of hostile emitters and aircraft electronic protection and attack. Both phases allow air-to-ground autonomous targeting at standoff ranges. The Navy plans to upgrade AESA's reconnaissance features with Synthetic Aperture Radar (SAR) technology and other hardware and software improvements.

SHARP is a state-of-the-art tactical air reconnaissance system that replaces the Tactical Airborne Reconnaissance Pod System (TARPS). Installed on the centerline of the F/A-18E/F, SHARP will employ a suite of sensors to collect infrared, visible, and SAR digital imagery at medium and high altitudes, in all weather conditions. This will enhance Naval Aviation's capability to deliver weapons guided by GPS and digital imagery.

The Joint Signals Intelligence Avionics Family (JSAF) Block Modernization Program (JMOD) is a state-of-the-art "block-mod" program for the EP-3 *Aries II* aircraft. JMOD is an open-architecture system for intelligence collection and dissemination that builds on the connectivity of the Sensor System Improvement Program (SSIP). This program is upgraded incrementally during scheduled Depot-Level maintenance and will provide the *Aries* with a system that exploits threat emissions beyond the year 2020.

The Radar Modernization Program (RMP) on the E-2D *Advanced Hawkeye* represents a two-generation technological leap that will extend management of the tactical battlespace overland to a point far beyond the horizon. The advanced digital radar will provide precision air surveillance and increased reaction time, making it critical to network centric air operations. This system, when coupled with CEC, will fully integrate the E-2D *Advanced Hawkeye* into the dual role of TBMD/CMD. In cooperation with *AEGIS* cruisers and destroyers, and upgraded Standard Missiles (SM-2 Block IVA and SM-3), this capability allows the CSG to provide theater-wide cruise and ballistic missile defense for homeland/allied nation security and U.S./coalition force protection.

The AQS-22 ALFS will be installed in the MH-60R Multi-Mission Helicopter. An active/passive sonar system with 2,500 feet of cable, ALFS quadruples the area coverage of previously fielded dipping sonars.